

WHAT IS CLAIMED IS:

1 1. A fingerprint data synthesis method, comprising the
2 steps of:

3 extracting minutiae from each of a plurality of
4 fingerprint images to produce fingerprint data including
5 information regarding the minutiae for each of the
6 fingerprint images;

7 investigating a correspondence of the minutiae
8 between the plurality of fingerprint data to search for the
9 same minutiae included commonly in two or more of the
10 plurality of fingerprint data as common minutiae;

11 selecting one of the common minutiae as a minutia
12 representative of the common minutiae to synthesize the
13 plurality of fingerprint data to produce one synthetic
14 fingerprint data; and

15 validating the synthetic fingerprint data.

1 2. A fingerprint data synthesis apparatus, comprising:

2 a fingerprint data extraction section for extracting
3 minutiae from each of a plurality of fingerprint images to
4 produce fingerprint data including information regarding
5 the minutiae for each of the fingerprint images;

6 a fingerprint data storage section for storing the
7 plurality of fingerprint data produced by said fingerprint
8 data extraction section;

9 a common minutia searching section for investigating

10 a correspondence of the minutiae between the plurality of
 11 fingerprint data to search for the same minutiae included
 12 commonly in two or more of the plurality of fingerprint data
 13 as common minutiae;

14 a fingerprint data synthesis section for selecting
 15 one of the common minutiae as a minutia representative of
 16 the common minutiae to synthesize the plurality of
 17 fingerprint data to produce one synthetic fingerprint data;
 18 and

19 a validation section for validating the synthetic
 20 fingerprint data.

1 3. The fingerprint data synthesis apparatus as claimed in
 2 claim 2, wherein said validation section confirms at least
 3 one of validity of a range of presence of the minutiae in
 4 the synthetic fingerprint data, validity of one-sidedness
 5 of presence of the minutiae in the synthetic fingerprint
 6 data, validity of relational information between the
 7 minutiae in the synthetic fingerprint data and validity of
 8 the number of the minutiae in the synthetic fingerprint data
 9 to validate the synthetic fingerprint data.

1 4. The fingerprint data synthesis apparatus as claimed in
 2 claim 3, wherein said validation section numerically
 3 evaluates and confirms any of the criteria of validity and
 4 determines the validity of the synthetic fingerprint data
 5 based on the evaluation value or values of the validity.

1 5. The fingerprint data synthesis apparatus as claimed in
2 claim 2, further comprising a minutia reliability
3 calculation section for calculating a reliability value of
4 each of the minutiae of the plurality of fingerprint data,
5 and wherein said fingerprint data synthesis section selects
6 the minutia representative of the common minutiae based on
7 the reliability values calculated by said minutia
8 reliability calculation section.

1 6. The fingerprint data synthesis apparatus as claimed in
2 claim 5, wherein said minutia reliability calculation
3 section calculates the reliability value of each of the
4 minutiae based on a difference between an orientation of
5 the minutia and an orientation of a ridge.

1 7. The fingerprint data synthesis apparatus as claimed in
2 claim 5, wherein said minutia reliability calculation
3 section calculates the reliability value of each of the
4 minutiae based on a length of a ridge or a distance from
5 the minutia to a neighboring minutia.

1 8. The fingerprint data synthesis apparatus as claimed in
2 claim 5, wherein said minutia reliability calculation
3 section calculates the reliability value of each of the
4 minutiae based on a distance from the minutia to a neighboring
5 ridge.

1 9. The fingerprint data synthesis apparatus as claimed in
2 claim 5, wherein said minutia reliability calculation
3 section calculates the reliability value of each of the
4 minutiae based on a positional relationship of the minutia
5 to a neighboring minutia.

1 10. The fingerprint data synthesis apparatus as claimed
2 in claim 5, further comprising a verification section for
3 verifying the plurality of fingerprint data, and wherein
4 said minutia reliability calculation section calculates,
5 for each of the minutiae in the plurality of fingerprint
6 data, a verification coincidence evaluation value for
7 evaluation of verification coincidence possibility of the
8 minutia as the reliability value based on a result of the
9 verification by said verification section.

1 11. The fingerprint data synthesis apparatus as claimed
2 in claim 10, wherein said minutia reliability calculation
3 section calculates the verification coincidence evaluation
4 value based on at least one of results of verification of
5 two minutiae of an object of verification with regard to
6 a position, a type and an orientation by said verification
7 section.

1 12. The fingerprint data synthesis apparatus as claimed
2 in claim 10, wherein said minutia reliability calculation

3 section calculates the verification coincidence evaluation
4 value based on a result of verification of two minutiae of
5 an object of verification with regard to relational
6 information between each of the verification object minutiae
7 and another minutia by said verification section.

1 13. The fingerprint data synthesis apparatus as claimed
2 in claim 12, wherein the relational information is at least
3 one of a position, a type and an orientation of the other
4 minutia.

1 14. The fingerprint data synthesis apparatus as claimed
2 in claim 12, wherein the relational information is the number
3 of ridges from each of the minutiae of the verification object
4 to the other minutia.

1 15. The fingerprint data synthesis apparatus as claimed
2 in claim 12, wherein the relational information is a
3 connection pattern from each of the minutiae of the
4 verification object to the other minutia along a ridge.

1 16. The fingerprint data synthesis apparatus as claimed
2 in claim 10, wherein said minutia reliability calculation
3 section calculates the number of times of verification
4 coincidence of each of the minutiae as the verification
5 coincidence evaluation value.

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1 17. The fingerprint data synthesis apparatus as claimed
2 in claim 5, wherein said minutia reliability calculation
3 section modifies the reliability value of each of the
4 minutiae based on the reliability value or values of a
5 neighboring minutia or minutiae.

1 18. The fingerprint data synthesis apparatus as claimed
2 in claim 10, wherein said verification section functions
3 also as said common minutia searching section.

1 19. The fingerprint data synthesis apparatus as claimed
2 in claim 10, wherein said fingerprint data synthesis section
3 refers to a result of the verification of relational
4 information between each of the minutiae and another minutia
5 by said verification section, and collects that relational
6 information which has high reliability to produce
7 synthesized relational information, and uses the
8 synthesized relational information as the relational
9 information of the minutiae from which the synthetic
10 fingerprint data are formed.

1 20. The fingerprint data synthesis apparatus as claimed
2 in claim 2, wherein, when said fingerprint data synthesis
3 section produces the synthetic fingerprint data, said
4 fingerprint data synthesis section performs positioning of
5 the minutiae from which the synthetic fingerprint data are
6 produced with reference to a minutia included commonly in

7 the plurality of fingerprint data.

1 21. The fingerprint data synthesis apparatus as claimed
2 in claim 2, wherein, when said fingerprint data synthesis
3 section produces the synthetic fingerprint data, said
4 fingerprint data synthesis section performs positioning of
5 the minutiae from which the synthetic fingerprint data are
6 produced with reference to the center of a fingerprint
7 determined from each of the fingerprint images.

1 22. The fingerprint data synthesis apparatus as claimed
2 in claim 2, wherein, when said fingerprint data synthesis
3 section produces the synthetic fingerprint data, said
4 fingerprint data synthesis section performs positioning of
5 the minutiae from which the synthetic fingerprint data are
6 produced with reference to a minutia selected from among
7 the minutiae included in the synthetic fingerprint data being
8 produced.

1 23. A computer-readable recording medium on which a
2 fingerprint data synthesis program is recorded for causing
3 a computer to function as:

4 a fingerprint data extraction section for extracting
5 minutiae from each of a plurality of fingerprint images to
6 produce fingerprint data including information regarding
7 the minutiae for each of the fingerprint images;

8 a common minutia searching section for investigating

9 a correspondence of the minutiae between the plurality of
10 fingerprint data to search for the same minutiae included
11 commonly in two or more of the plurality of fingerprint data
12 as common minutiae;

13 a fingerprint data synthesis section for selecting
14 one of the common minutiae as a minutia representative of
15 the common minutiae to synthesize the plurality of
16 fingerprint data to produce one synthetic fingerprint data;
17 and

18 a validation section for validating the synthetic
19 fingerprint data.

1 24. A biometric information synthesis method, comprising
2 the steps of:

3 extracting feature elements from each of a plurality
4 of sets of raw biometric data obtained from the same organism
5 to produce biometric information including information
6 regarding the feature elements for each of the sets of raw
7 biometric data;

8 investigating a correspondence of the feature
9 elements between the plurality of biometric information to
10 search for the same feature elements included commonly in
11 two or more of the sets of biometric information as common
12 feature elements;

13 selecting one of the common feature elements as a
14 feature element representative of the common feature
15 elements to synthesize the plurality of biometric

16 information to produce one synthesized biometric
17 information; and
18 validating the synthesized biometric information.

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